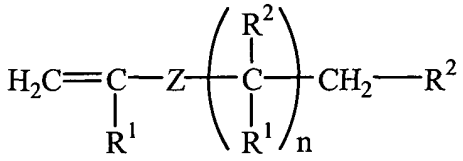
CLAIMS

1. A water-insoluble interpenetrating polymer network comprising:

a first polymer derived from a monomer having the general structure



where R^1 is independently in each occurrence H, C_1-C_4 alkyl, C_1-C_4 hydroxy alkyl, Cl or Br; Z is a nullity, O, $C(O)NR^3$ or C(O); R^2 is independently in each occurrence H, C_1-C_4 alkyl, C_1-C_4 hydroxy alkyl, C_0-C_4 SO_3M or C_0-C_4 PO_2H_2; R^3 is H, C_1-C_4 alkyl, C_1-C_4 hydroxy alkyl, where M is H, Li, Na, K, Zn, Mg, Ca, Ba, Sr, Cs and Al; n is an integer from 1 to 5, inclusive, with the proviso that adjacent carbon atoms lack sulfonic and/or phosphonic acid groups and at least one sulfonic acid or phosphonic acid group is present in the structure; and

a second polymer polymerized independently of said first polymer and interpenetrating said first polymer wherein said second polymer is more permeable to water than methanol.

2. The interpenetrating polymer network of claim 1 wherein said monomer has a sulfonic acid group.

3. The interpenetrating polymer network of claim 1 wherein Z is $C(O)NR^3$.

4. The interpenetrating polymer network of claim 1 wherein said monomer has only a single sulfonic acid or phosphonic acid group.

5. The interpenetrating polymer network of claim 1 wherein said monomer is selected from a group consisting of: 2-acrylamido-2-methyl propane sulfonic acid, acryl ethane sulfonic acid, methacryl ethane phosphonic acid, 2-methacrylamido-N-ethyl sulfonic acid, and methacryl-2-hydroxyethane sulfonic acid.

6. The interpenetrating polymer network of claim 1 wherein said monomer is 2-acrylamido-2-methyl propane sulfonic acid.

7. The interpenetrating polymer network of claim 1 wherein said first polymer is present from 2 to 40 total weight percent.

8. The interpenetrating polymer network of claim 1 further comprising a copolymer monomer copolymerized with said monomer.

9. The interpenetrating polymer network of claim 8 wherein said copolymer monomer is selected from a group consisting of: 2-hydroxy ethyl methacrylate, hydroxypropyl methacrylate, 4-hydroxybutyl methacrylate, 2-hydroxyethyl acrylate, 2-hydroxypropyl acrylate, methyl methacrylate, N-t-butylacrylamide, N,N'-dimethylacrylamide, (vinyl)sulfonic acid, styrene, styrenesulfonic acid, as well as many other acrylamides, acrylates, hydroxyalkyl acrylates and methacrylates.

10. The interpenetrating polymer network of claim 8 wherein said copolymer monomer is present from 20 to 75 total weight percent.

11. The interpenetrating polymer network of claim 8 wherein said monomer is present at a lesser weight percent than said copolymer monomer.

12. The interpenetrating polymer network of claim 8 further comprising a cross-linking agent.

13. The interpenetrating polymer network according to claim 8 further comprising a polymerization initiator.

14. The interpenetrating polymer network of claim 12 wherein said cross-linking agent is selected from a group consisting of: ethylene glycol dimethacrylate (EGDM), ethylene glycol diacrylate, tetraethylene glycol diacrylate, tetraethylene glycol dimethacrylate, poly(ethylene glycol) diacrylate, poly(ethylene glycol) monomethacrylate, propylene glycol diglycidyl ether, N, N'-methylene-bis-acrylamide, 3,3-tetramethyleneglutaric acid.

15. The interpenetrating polymer network of claim 1 wherein said second polymer is polyvinyl alcohol.

16. The interpenetrating polymer network of claim 15 further comprising a condensation reaction cross-linking agent.

17. The interpenetrating polymer network of claim 16 wherein said polyvinyl alcohol is uniformly cross-linked.

18. The interpenetrating polymer network of claim 16 wherein a cross-link density gradient exists within said polyvinyl alcohol.

19. The interpenetrating polymer network of claim 1 further comprising a filler selected from the group consisting of: inorganic salt hydrates, silica particulate, metal sols, metal nanocrystals, and semiconductor nanocrystals.

20. A film produced from an interpenetrating polymer network of claim 1.

21. The film of claim 20 having proton conductivity and greater permeability to water than methanol.

22. The film of claim 20 having a first surface in contact with an adherent selected from the group consisting of: a catalyst and a specific binding or recognition moiety for a target analyte.

23. A process for forming an interpenetrating polymer network comprising the steps of:

mixing a solution containing polyvinyl alcohol with a first polymer monomer containing an acid group selected from the group consisting of: sulfonic and phosphonic;

inducing cross-linking of said first polymer monomer under free radical polymerization conditions; and

inducing condensation reaction cross linking of said polyvinyl alcohol to obtain an interpenetrating polymer network.

24. The process of claim 23 further comprising the step of: adding a copolymer monomer to the mixture, said copolymer monomer capable of copolymerizing with said first polymer monomer under free radical polymerization conditions.

25. The process of claim 24 further comprising adding a free radical cross-linking agent and a free radical polymerization initiator to the mixture.

26. The process of claim 23 wherein the steps of free radical polymerization and condensation reaction polymerization are sequentially reversed.

27. The process of claim 23 further comprising the step of adding a condensation reaction cross-linking agent to the mixture that is capable of cross-linking said polyvinyl alcohol.

28. The process of claim 27 wherein said cross-linking agent is exposed to only a portion of said interpenetrating polymer network such that a polyvinyl alcohol cross-linking gradient is created.